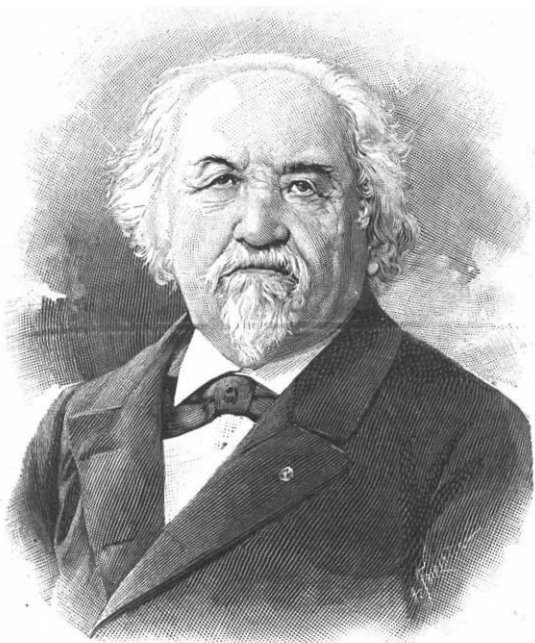


prizes, we find his name almost invariably appearing on the lists of judges, and he appears to have been no less energetic in drawing up biographical notices of deceased members. Nevertheless, we find him in 1895 writing on a geometrical theorem, and in 1896 breaking a lance with Boltzmann on that ever-fascinating and never-satisfying theory, the Kinetic Theory of Gases. This is the last time that we have been able to find Bertrand's name in the *Comptes rendus* as the writer of a paper, though it repeatedly figures in other connections.

Bertrand's countenance and carriage are described as "characteristic." He was "short, thick-set, lively, vigorous, and very kind-looking. His face was covered with scars, and his nose had lost its bridge," as we have seen, as the result of the Meudon railway accident, but the imprint of misfortune would appear to have given a tender pathos to his appearance, which seemed to draw his friends nearer to him. As a relaxation from work, he is said to have never tired of reading the novels of Sir Walter Scott, whom he described as "the greatest



Joseph Bertrand.
(From *La Nature*.)

novelist that ever lived." He leaves several sons, one of whom, M. Marcel Bertrand, a mining engineer, is himself a member of the Academy of Sciences, and rather well known.

If Bertrand's mathematical work earned for him the respect and admiration of men of science far and wide, his philanthropy endeared him to the smaller circle with whom he was more intimately known. The enjoyment he derived from his own studies was fully equalled by his delight at reading the works of others. He constantly sought to bring to light fresh workers, and the few words of kind reassurance and appreciation, not to mention the passing on of an idea or the lending a helping hand over a difficulty, so much valued by the budding mathematician, were never wanting at the critical moment. In endeavouring to help those less favoured by fortune than himself, Bertrand would give much time and thought as to the best way of rendering them assistance. In 1857 Baron Thénard founded the "Société des Amis des Sciences," an institution the

object of which is to assist scientific men and their families when in need. Bertrand was one of the first to support the Society, and his signature figures along with those of Boussingault, Quatrefages, Becquerel, Sénarmont, Balard, Daubrée, Frémy, Deville, Berthelot and Pasteur in all its early records. In 1864 Bertrand was elected on the council, in May 1895 he was nominated vice-president, and in November of the same year he succeeded Pasteur as president. The Pasteur Institute also owes much to his energetic support.

Mathematical investigation is essentially a search for truth; but with Bertrand the love of truth and hatred of all that is false, was not confined to the mathematical side of his character; this trait was indeed deeply engrained into his whole existence. While there was nothing he would not do for those he knew to be deserving, he seems to have possessed a happy knack of effectually disposing of his enemies by a few strokes of sarcasm, which must have been the more withering because they so completely placed his adversaries in the wrong.

Had Joseph Bertrand's life and health been spared a little longer, there can be no doubt that he would have taken a foremost part in the liberal programme of congresses with which Paris hopes to attract a distinguished assembly of *savants* from all quarters of the globe, and we are sure that many English readers of his "Differential and Integral Calculus" would gladly have availed themselves of the opportunity of coming into personal contact with the well-known French mathematician. The loss of so prominent a figure in the Parisian world of science would at any time be deeply deplored, and his absence from the brilliant gatherings that are to be, only adds to our regret at losing one who has done much to simplify and popularise the study of mathematics.

At the funeral, discourses were delivered by M. Jules Lemaitre, director of the Académie Française; by M. Maurice Lévy, president of the Académie; by M. Berthelot, his fellow secretary of the Académie des Sciences; by M. Gaston Darboux, representing the Société des Amis des Sciences; by M. A. Cornu, representing the Ecole Polytechnique; by M. Duclaux, director of the Institut Pasteur; by M. Gaston Paris, administrator of the Collège de France; and by M. Georges Perrot, director of the Ecole Normale. In endeavouring to portray the life of a man of many and varied parts like Bertrand, we have largely drawn on the information contained in these orations, which are published in the *Comptes rendus*; but while it has thus been possible to enter into many of the details of Bertrand's life, his character as an individual can only be appreciated by reading separately the thoughts expressed by those who have known him intimately in his many capacities. Of these expressions, we can do no better than conclude with the words of M. Georges Perrot:—

"Il n'a pas été moins grand par le cœur que par l'esprit."

G. H. BRYAN.

NOTES.

WE notice with regret the announcement that the Duke of Argyll died on Tuesday morning, at the age of seventy-seven years. No definite arrangement has yet been made with regard to the funeral, but it is believed the interment will take place next week.

THE international conference for the protection of wild animals in Africa, announced last week, was opened at the Foreign Office on April 24, and was attended by plenipotentiaries of France, Germany, Great Britain, Congo Independent States, Italy, Portugal and Spain. Readers of NATURE hardly need to

be reminded that such a conference is of deep importance, and it is sincerely to be hoped that a definite plan of action will be decided upon as a result of its deliberations. A leader in Tuesday's *Times* directs attention to the necessity of an international agreement to restrain the extermination of many of the mammals, birds and fishes in Africa. It is useless to preserve wild animals in one part of Africa while they are killed off without restriction in neighbouring districts by people accredited as citizens of another European State. This is why an international agreement is sought for. It is needless to dwell upon the unnecessary slaughter of elephants, rhinoceroses, hippopotami, and the larger kinds of antelopes, elands, koodoos, sables and others since the Cape Colony, the Boer States, and the Rhodesian territories have been opened up to colonisation. Half a century ago, as the *Times* points out, the whole of South Africa below the Zambesi swarmed with antelopes and other game, including lions and leopards. Now, except in a few rare districts, there is nothing more of the kind to be found than in Hampshire or Devonshire. To remedy this state of things, the *Times* advocates the establishment of large reserves, like the Yellowstone Park in the United States, where wild animals can be allowed to live their natural life. It is easier to bring this to pass in Central Africa, where so much land is practically waste, than in countries where civilisation has made its way. The experiment has been tried, on a small scale, in many places, and with considerable success. In a narrow strip of forest country on the South Coast the Government of the Cape Colony preserves some herds of elephants. Mr. Rhodes has done much for the preservation of antelopes both on his property near Cape Town and in Rhodesia. There appears to be no reason why very large areas in Central Africa should not be set apart as refuges in which all the rich animal life of the continent might be permitted to propagate and develop under something approaching to natural conditions. Ten or twelve of these great reserves would keep alive, for a time at least, the striking types of animal life in which Africa is so extraordinarily fertile.

In connection with the subject of the foregoing note, some remarks made by Prof. S. P. Langley in the latest report of the Smithsonian Institution are of interest. It is pointed out that the National Zoological Park at Washington was established with the object of preserving the fast vanishing species of American animals. The changes which were noticed in the western part of America some years ago are now occurring in Alaska. With the advent of the settler and the railroad in the West, the great herds of animals which ranged over the western territory of the United States were practically exterminated, though by strenuous efforts here and there small collections of the buffalo and other large interesting mammals, like those in the National Zoological Park, have been kept alive. Whether a race can be made to survive in this way is open to question, but the effort at least should be made, and the Smithsonian Institution is trying to promote this survival. The United States still possesses at Kadiak Island, on the south-east coast of Alaska, a few living specimens of the largest carnivorous animal now in the world—a monster bear—which has not at any time been brought into captivity. Prof. Langley has been trying for two years, through American companies on the island, to obtain live specimens of this and other great mammals of Alaska with the hope of preserving the species before the inevitable opening of all that distant territory of the United States to civilisation and settlement will have resulted in the extermination of its large fauna, but these efforts have hitherto been wholly unsuccessful.

THE summer meeting of the Institution of Mechanical Engineers will be held in London during the last week in June.

NO. 1591, VOL. 61]

THE Bruce gold medal of the Astronomical Society of the Pacific has been awarded to Dr. David Gill, C.B., F.R.S.

THE *Daily News* announces the death of Prof. A. Milne-Edwards, director of the Natural History Museum at Paris.

SIR J. BARRY TUKE, well-known for his works on mental diseases, has consented to become a candidate for the vacancy in the parliamentary representation of the Universities of Edinburgh and St. Andrews, caused by the death of Sir William Priestley.

WE learn from the *Chemical News* that an international banquet will be held by the Chemical Society of Paris in honour of those gentlemen who, by their presence at the Universal Exhibition, will represent pure and applied chemistry. The date fixed for the banquet is Thursday, July 19, when the chair will be taken by M. Berthelot, honorary president.

THE economic position of the German Empire in 1900 forms the subject of a report by Mr. Gastrell, commercial attaché to Her Majesty's Embassy at Berlin, which has been issued by the Foreign Office. It is instructive to trace the steps in the progress of the German Empire towards the important position it holds to-day. Mr. Gastrell points out that, in industrial and commercial matters, the first twenty years of the existence of the German Empire—from 1871 to 1890—were devoted to the elementary education of its people; the following ten years—1891 to 1900—have been spent on their higher education; and the end of the century sees in them a body of men each an expert in his own trade or profession. The bases on which Germany's power stands are primarily its trade and, in a minor degree, its agricultural resources. The population of Germany to-day is probably larger than that of the United Kingdom by some 15,000,000, and greater than that of France by about 17,000,000.

THE facilities which will be granted by the Portuguese Government to foreign astronomers visiting Portugal in May, for the purpose of viewing the total eclipse of the sun, have been made the subject of an official announcement by the Foreign Office. Astronomers from abroad will be exempt from payment of the usual Customs duties on production at the Custom House, on arrival, of a certificate drawn up by the astronomical society to which they may belong, setting forth their names, and describing the instruments and books which are to be imported. This certificate, however, should be legalised by the nearest Portuguese Consulate before starting. Further, it is announced that the Ministry of War has informed the Ministry of Education that all the military authorities of the districts of Vizen, Aveira, Guarda, Castello Branco and Coimbra will afford any possible assistance to astronomers during the observations, and that tents will be lent to observers, on a request being addressed to the Ministry of War in Lisbon to that effect. A Government notice has now been published in the *Official Gazette*, stating that the King has nominated a Royal Commission for the purpose of assisting in every way those who may come from abroad for scientific observations, and for superintending astronomical arrangements generally. This commission will sit either at the Royal Observatory, Lisbon, or at the Geographical Society, Lisbon; its president is his Excellency Senhor Marianno de Carvalho. If any British astronomers going to Portugal will communicate with her Majesty's Minister shortly before their arrival, he will be able to take steps to facilitate the object of their visit.

THE annual meeting of the Iron and Steel Institute will be held on Wednesday and Thursday, May 9 and 10, under the presidency of Sir William Roberts-Austen, K.C.B., F.R.S.

On the first day, the Bessemer gold medal for 1900 will be presented to Mr. Henri de Wendel, president of the Comité des Forges de France. During the meeting, papers will be read and discussed on ingots for gun tubes and propeller shafts; the manufacture and application of water-gas; the equalisation of the temperature of hot blast; blowing-engines driven by crude blast-furnace gas; the solution theory of iron; the use of fluid metal in the open-hearth furnace; the manganese ores of Brazil; the utilisation of blast-furnace slag; iron and phosphorus; and the continuous working of the open-hearth furnace. The annual dinner of the Institute will be held at the Hotel Cecil on May 9.

It may be remembered that in France, last year, the *Matin* organised a race of about 1400 miles, known as the "Tour de France," which effectually brought the powers of automobile vehicles to the notice of all sections of the population. In some of these contests very surprising results have been attained. The winning car in a recent race at Pau, says the *Times*, accomplished a distance of 208 miles without a stop, at an average speed of 44 $\frac{3}{4}$ miles an hour, covering the first 34 $\frac{1}{2}$ miles in the remarkable time of 33 $\frac{3}{4}$ minutes. Stimulated by the success of last year's "Tour de France," both in promoting the use of motor cars and in revealing the types of car best suited for the purposes in view, the Automobile Club of Great Britain and France has arranged a trial of over 1000 miles, to be carried out on a route passing through the following centres of population:—Bristol, Birmingham, Manchester, Edinburgh, Newcastle-on-Tyne, Leeds and Sheffield. The procession of cars started from Hyde Park Corner on Monday, and the survivors will return to London on Saturday, May 12. Eleven days will be devoted to covering the distance, and at each of the above-named places the vehicles will be on exhibition for one clear day. They will also be exhibited for a few hours at Cheltenham, Kendal, Carlisle, York, Lincoln and Nottingham, and at the conclusion of the trial there will be a week's exhibition at Prince's Club, Knightsbridge. Over eighty vehicles are taking part in the trial, of which fifty-three have been entered by manufacturers and agents, and the remainder by private owners.

THE death is announced of Prof. Silas W. Holman, emeritus professor of physics at the Massachusetts Institute of Technology.

An appreciative notice of the life and scientific career of the late Mr. J. J. Walker, F.R.S., who died on February 15, is contributed to the *University College School Magazine* by Mr. R. Tucker. Mr. Walker was appointed lecturer in applied mathematics and physics at the school in 1865, and in the same year became a member of the London Mathematical Society. He was a member of the council of the society from November 1869 to November 1874, and then again from November 1876 to November 1894; he was vice-president for two periods of two years, and president from November 1888 to November 1890. He contributed some twenty-four papers to the *Proceedings*, the longest of which were a method in the analysis of plane curves and on the satellite of a line relatively to a cubic. His presidential address was "On the influence of applied on the progress of pure mathematics." This, as remarked by his successor in office, Prof. Greenhill, "showed us how many of the most abstruse theories of pure analysis owe their origin to ideas which arose in connection with concrete and even practical requirements." His range of mathematical reading was very extensive, and he contributed papers to the Royal Society and most of the mathematical journals. From 1868 to 1882 Mr. Walker was vice-principal of University Hall. He was a member of the Physical Society, and was elected F.R.S. in 1883.

THE death of M. Gustave Planchon has removed from our midst perhaps the most active scientific pharmacist of the

present day. Although typically French, Planchon's works, so far as their matter is concerned, are cosmopolitan, his "Simple Drugs of Vegetable Origin," for instance, being known to all students of pharmacy. Planchon was a graduate of Montpellier, and the first part of his career was spent in teaching pharmacy in the Montpellier Faculty of Medicine. In 1866, however, he was called to Paris as Professor of the Natural History of Medicaments. He was appointed Director of the Paris School of Pharmacy in 1886, and continued to hold that position until his death a few days ago. Most prominent among his contributions to pharmacy are his, the work mentioned above, and, brochures upon quinine, ipecacuanha and jaborandi. He was also a great authority upon the history of pharmacy and medicinal plants lore. He was quite recently elected President of the International Congress of Pharmacy, which is to take place in Paris next August, and it will be a matter of most sincere regret that one who would have filled the duties of this position so ably has been so unexpectedly cut off. Besides those who admire his work, and him on account of it, he leaves behind a large circle of close friends who will all their lives miss his kindly personality.

THE Paris correspondent of the *Times* reports that a geologist, M. Neuburgher, has just been examining, on behalf of the French Government, the mineral oil country of Oran, Algeria. It is stated that there is a tract, of at least 120 miles in length, exceedingly rich in petroleum, resembling the rich districts of Baku and Galicia.

THE death of an aeronaut at Paris from poisoning by hydrogen arsenide shows the necessity of taking precautions to purify the gas used for filling balloons. From a note in *La Nature* it appears that upon the occasion on which the accident occurred the balloon was filled in the ordinary way, and nothing peculiar was noticed in the character of the gas; but some hours afterwards the persons who had assisted in the operation were taken seriously ill, and one of them did not recover. The accident directs attention to a danger frequently overlooked.

ANOTHER effort to discover some clue to the fate of Andrée will be made this summer. The *National Geographic Magazine* states that the Swedish-Russian Expedition, which will leave about June 1 for Spitzbergen to relieve the party that is at present engaged in the work of measuring an arc of the meridian in that latitude, plans to make a detour to King Charles Land and carefully search the entire neighbourhood. It will be remembered that in September of last year a buoy was picked up on the north coast of King Charles Land, at 80° north latitude and 25° east longitude, marked "Andrée's Polar Expedition." When taken to Stockholm and opened, it proved to be what Andrée had called "the North Pole Buoy," and in which he was to place a message when he passed the North Pole. However, a microscopic examination of the interior could discover no message. As the buoy could not have drifted to King Charles Land from the neighbourhood of the Pole, the only conclusion possible is that it was a part of the wreckage of the expedition, and that possibly more wreckage may be found near by.

SWISS engineers, though so successful in the manufacture of various classes of machinery, labour under the disability that practically the whole of the iron employed, valued at over two million pounds annually, has to be imported from Germany and elsewhere. This is due, not so much to the absence of iron ores within their boundaries as to the want of coal wherewith to smelt it. We learn from the *Electrician* that recent researches in electro-metallurgy promise a means of overcoming the defect, and a scheme for the application of the electric furnace to the smelting of iron on the large scale is being

developed by Herr Müller Landsmann in the Bernese Oberland, near Meiringen. A concession has been obtained from the State for the working of an outcrop of hematite. The vein has a thickness of 7 feet, and is visible for a length of two miles along the mountain face. Thence the ore will be transported by an aerial ropeway to Innetkirchen below. The concession obtained for the water power available from the Aar in the immediate neighbourhood, amounting to 60,000 h.p., will be used to drive the machinery required, and to supply the power for the electric smelting furnaces.

AGRICULTURAL experiment promises to become an important branch of technical education in rural districts. Prof. W. Somerville's eighth annual report on experiments with crops and stock in the counties of Cumberland, Durham and Northumberland is an instance in point. It contains the results of well-arranged experiments of direct value to the farmers of the districts in which they were made; and by encouraging work of this kind the councils of the counties mentioned are doing a service both to technical education and the agricultural community. Many of the investigations described deal with the values of natural and artificial manures for different crops. A note on the eradication of charlock amongst corn crops by spraying with solutions of sulphates of copper and iron is of wide interest. The corn crop was in no case permanently injured by the treatment, though in some cases it was temporarily harmed. In no case was clover at all injured. On the whole, a 4 per cent. solution of copper sulphate is recommended for application at the rate of 25 to 40 gallons per acre, the dressing being repeated after the interval of a week if necessary.

AT a meeting of the Academy of Science of St. Louis, on April 2, Dr. W. H. Warren read a paper giving an outline of recent progress in the chemistry of perfumes. For the most part, these substances are high boiling oils. Formerly these oils, which are complex mixtures of several compounds, were obtained exclusively from flowers, but recently some of the essential principles have been produced by chemical means, whereas other artificial perfumes are mere imitations. With a few exceptions, the essential principles which give the perfumes their value belong to the complex class of organic compounds known as the terpenes. Nearly every substance having the properties of a perfume has in its molecule certain atomic groups the presence of which exerts a marked influence on the odour. Among the more important of these may be mentioned the aldehyde, ketone, ester, ether and alcohol groups. Wonderful progress has been made in the knowledge of the terpenes and of their derivatives during the past ten or fifteen years, among the chemists who have taken a prominent part in the labour being Wallach, Baeyer and Tiemann.

PARTICULARS concerning the establishment of the Hamburg Institute for the study of nautical and tropical hygiene are given in the *Board of Trade Journal*. The Institute, like those of Liverpool and London, is a natural outgrowth of new conditions. The rapid transition from sails to steam, as a means of propulsion, the almost universal substitution of steel for wood in the construction of sea-going vessels, and the improvement in the food provided for seamen, have brought about a marked change alike in the ailments and the nature of the accidents occurring to members of the crews. Scurvy, night blindness, the so-called ship anæmia, chronic ailments of the digestive organs and canals, as well as lead-poisoning, even if not yet absolutely extinct, have become rare in a very marked degree. In their place, however, a series of new diseases has demanded the closest attention of the medical faculty. To deal with these diseases, and cases of malaria, beri-beri, black water fever, and other tropical disorders, special hospitals or institutes at large

ports are needed. The Hamburg Institute is to comprise a division for patients, provided with sixty beds and a laboratory, which will be fitted for bacteriological as well as for chemical research, space being provided for twelve investigators. Five tables for research will be reserved for qualified military medical aspirants for service with the German Colonial troops or under the German Colonial Department. Their course of study of the etiology, symptoms and treatment of malaria and other grave tropical diseases, of tropical physiology and tropical hygiene, will extend over several months. Attention will also be given to the more general methods of hygienic investigation, so that the students in question, when opportunity should be forthcoming, may possess the requisite training for extended research abroad, combined with the ability to report technically thereon. The additional tables in the laboratory will be placed at the disposal of the naval and mercantile services, as well as of medical men, who, having returned from the tropics, are desirous of pursuing special branches of research. The participation of Prof. Koch in the investigation of tropical diseases has greatly assisted the decision of the German authorities in establishing the Hamburg Institute.

THE complete history of the great Japanese earthquake of 1891 is still unwritten; but Prof. Omori has contributed an interesting note upon it to the last volume of the *Publications of the Earthquake Investigation Committee*. The total disturbed area is estimated at about 900,000 sq. km. The maximum acceleration at various places was calculated from a large number of overturned bodies; that at Nagoya being 2600, and at two other places more than 4300 km., per second. The range of the motion at Nagoya must have been about 233 km. Many observations were also made on the direction of overturned bodies, from which it appears that in and near the Mino-Owari plain, the principal direction of the earthquake motion was approximately normal to, and directed towards, the meizoseismal zone.

FOR several years Prof. Omori has studied the subject of earthquake measurement in a brick building. One of Prof. Ewing's horizontal pendulum seismographs was fixed near the top of an external wall of the Engineering College at Tokyo, whilst another was erected on the ground below. During the years 1894-98, ten moderate earthquakes were recorded, and it was found that if the earthquake consisted of comparatively slow vibrations (say, above half a second in duration), the motion was practically the same in both places; but if of quick-period vibrations, the motion of the top of the wall was about twice as great as that of the ground. Prof. Omori notices that, with destructive earthquakes, the damage of two-storied buildings is generally confined to the upper storey.

WE have received a reprint, from the *Transactions of the Royal Society of Canada*, of a note, by Mr. W. Bell Dawson, on some remarkable secondary tidal undulations registered at Halifax, N.S., Yarmouth, St. Paul Island, and St. John, N.B., on January 1 and 2 of this year. The secondary movements ranged from 10 per cent. of the whole amplitude of the tide at St. Paul Island, to no less than 45 per cent. at Yarmouth. The pilot chart of the North Atlantic shows that at least three storms, two of which developed hurricane force, passed over or near the region between December 26 and January 2. Mr. Dawson does not attack the general problem of the causes of secondary undulations, which are of very frequent occurrence off the eastern seaboard of Canada, but he draws attention to the favourable conditions which exist there for observing them. The most important feature as yet determined is that the secondary undulations do not become magnified in range in the same ratio as the main tidal undulation does, under the influence of the general form of the coast.

THE sudden rise of temperature over the British Islands towards the close of last week, when the temperature in the neighbourhood of London reached 78°, owing to the presence of a large area of high barometric pressure, was a very welcome change from the recent exceptionally cold period to which the lateness of the spring in all parts of the country was due. This reading has only been once exceeded in April during the last twenty-five years. For the greater part of the month the mean of all the highest day readings was about 1° below the average, and it was not until the 19th that the temperature at Greenwich exceeded 64°; in many recent years a higher temperature has occurred in March. The returns published by the Meteorological Office show that the rainfall over England since February had been much below the average, and that the amount of bright sunshine had been deficient in most parts.

TO the March number of the *Agricultural Gazette* of New South Wales, Mr. W. W. Froggart, the Government Entomologist, communicates an important paper on the "plague" of locusts to which the country has lately been subjected. Although Australia has been visited by swarms of locusts from a very early period, it does not appear that these did much damage till the seventies, when farms had begun to occupy much of the open plains of Victoria and other districts. Between that period and 1891 New South Wales was devastated by swarms of the species known as *Pachytylus australis*; but in the serious visitation of 1899 the place of that kind was taken by *Epavromia terminalis*, which is believed to have moved into the colony from South Australia. Not only did the swarms destroy all the sheep-feed in the districts visited, but they likewise ruined some 20,000 acres of young wheat. Mr. Froggart concludes that an effectual remedy would be either to destroy the eggs, or to expose them in such a manner that they would be readily accessible to the attacks of birds. But he has also hopes that inoculation of the immature insects with the so-called African locust-fungus would have good results.

THE March number of the *American Naturalist* contains some interesting remarks on the habits of the American gilled and blind salamander described some time ago by Dr. Stejneger under the name of *Typhlomolge*. A number of living specimens were obtained from subterranean waters at a depth of 181 feet below the surface, but only one of these survived for any length of time above ground. Unless disturbed, these salamanders spend their time in resting or in walking very slowly; when walking, they move a few steps at a time, pause awhile, and then once more advance. From the extreme slenderness of their limbs, Dr. Stejneger came to the conclusion that these were employed solely as feelers, and that progression was effected by means of the tail; but this conjecture is now shown to be incorrect.

FROM Mr. J. C. Thompson we have received a copy of his paper on tropical and northerly "plankton," published in the *Transactions* of the Liverpool Biological Society.

WE have to thank Messrs. Eigenmann and Schafer for a copy of their paper on the mosaic of single and twin cones in the retina of fishes, published in the February number of the *American Naturalist*.

THE *Irish Naturalist* for April contains an interesting account by Dr. R. F. Scharff upon all the species of whales and dolphins known to have visited the Irish coast, illustrated by good figures of their skulls, with the outline of the heads.

IN a paper on some abnormally-coloured Australian birds, in the *Victorian Naturalist*, Mr. R. Hall calls attention to the fact that while in New Zealand and South Australia birds display a tendency to albinism, in North Australia, as in India, the variation tends to the development of melanism.

NO. 1591, VOL. 61]

HITHERTO the genus of vampire bats known as *Monophyllus* has been represented only by a single species from Jamaica. In a recent issue of the *Proceedings* of the Washington Academy of Sciences, Mr. G. S. Miller describes three new representatives of the genus, at least one of which is from the mainland.

THE *Journal* of the South-Eastern Agricultural College, Wye, Kent—issued under the joint auspices of the Kent and Surrey County Councils—contains much valuable information in regard to pests and diseases which infect or afflict cattle and crops; the one of most local interest being an essay on "red mould" in hops.

MONSIEUR C. JANET, President of the Zoological Society of France, has favoured us with a copy of his "Essai sur la constitution morphologique de la Tête de l'Insecte," Paris, 1899. In this brochure, which is admirably illustrated, the author adopts the view that the true head of all insects is primarily composed of five segments.

WE have received from the Trustees of the British Museum the portion of vol. ii. of the "Catalogue of the Lepidoptera Phalæna" containing the plates, by Sir George Hampson. The execution of the coloured illustrations of these "Microlepidoptera" is all that can be desired; but we notice that the author has departed from recognised usage in calling the family *Arctiadae* instead of *Arctiidae*.

THE "Psychological Index," published annually by the *Psychological Review*, is well-known to be a comprehensive and orderly bibliography of original publications in all languages, on psychology taken in its widest sense. The "Index" for 1899 has just been published, and it occupies no less than 174 pages of the *Psychological Review*.

ENGLER'S *Botanisches Jahrbuch für Systematik, Pflanzengeschichte, und Pflanzengeographie* continues to be characterised by the value and excellence of its papers in the domain of systematic botany. The parts most recently received (vol. xxvii. Heft 5 and vol. xxviii. Heft 2) contain, among other contributions, the conclusion of the Editor's series of papers on the flora of Africa; a paper on experiments on variation in plants, by Krasan; an exhaustive paper on the genus *Thea*, and the anatomical and morphological characters of the teas of commerce, by J. Kochs; a monograph of the genus *Mollinia* (Monimiaceæ), by Janet R. Perkins.

THE report of the Epsom College Natural History Society reminds us that the study of natural objects and phenomena which the Board of Education is endeavouring to develop in rural schools, is already carried on in an admirable way by the boys in many of our public schools and colleges. We find in the present report abstracts of lectures, descriptions of work done in the astronomical, botanical, entomological, geological, photographic and zoological sections, a summary of meteorological observations, and tables of anthropological measurements of boys in the college. The lists of plants observed and dates of first blooms, of insect captures, and of the dates when various birds were seen, or their nest, eggs and young, are particularly interesting from the point of view of phenology. The evidence given by the report of interest in natural things and characteristics is gratifying to every lover of natural history, and a credit to Epsom College.

THE *Athenæum* makes the following announcement:—The "Diary of White of Selborne" is to be published. He kept it, as is well known, for more than twenty-five years, and used for the purpose a form "invented" by Daines Barrington, entitled "The Naturalists' Calendar," constructed for recording on each day, in proper columns, the readings of the thermometer and barometer; the direction of the wind; the measurement of the

rainfall; the weather; the appearance of leaves and flowers of plants; the appearance or disappearance of birds and insects; observations with regard to fish and other animals; and miscellaneous observations. But Gilbert White enriched his "Calendar" with much other matter. There are not only numerous disquisitions on points of natural history, but notes of events of public interest and of personal or domestic concern. These are written on interleaves, or such spaces as may happen to be available. It is proposed to arrange for the publication of the diary in the manner of the original in every substantial particular. There will be no editorial notes, except in elucidation of a few points of real obscurity. It will fill two large quartos of about 700 pages each, and Messrs. Constable and Co. are to be the publishers.

In the current number of the *Bulletin de la Classe des Sciences* of the Royal Belgian Academy is a paper by M. Henry, on some new reactions of formaldehyde. Phosphorus pentachloride and pentabromide give methylene dichloride and dibromide respectively, the latter in so good a yield as to be an advantageous method of preparation. Formaldehyde also reacts readily with acetyl chloride to give chlormethyl acetate, acetyl bromide giving the corresponding bromine compound. The yields are better than those given by the interaction of the halogen and methyl acetate.

THE same number of the *Bulletin* contains an exhaustive study, by M. Gillot, of the hydrolysis of raffinose by *Penicillium glaucum*. In solutions containing a mineral acid the mould is able to secrete a zymase capable of inverting raffinose, and this ferment is still produced, although more slowly, when the solution is neutral. In alkaline solutions the germination of the spores is retarded, the solution losing its alkalinity as the development of the mould proceeded, finally becoming acid. The zymase from a pure culture of the *Penicillium* was isolated, and raffinose inverted by its aid.

THE additions to the Zoological Society's Gardens during the past week include a — Baboon (*Cynocephalus*, sp. inc.) from Zanzibar, a Suricate (*Suricata tetralactyla*) from South Africa, a Common Boa (*Boa constrictor*), an Anaconda (*Eunectes murinus*) from South America, a Pin-tailed Sand-Grouse (*Pterocles alchata*), South European, deposited; a Panolia Deer (*Cervus eldi*, ♀) from Burmah, five Common Wigeon (*Mareca penelope*), three Pochards (*Fuligula ferina*), three Tufted Ducks (*Fuligula cristata*), four Goldeneyes (*Clangula glaucion*), European; a Common Boa (*Boa constrictor*) from South America, purchased; a Barbary Wild Sheep (*Ovis tragelaphus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN MAY.

- May 1. 8h. 58m. to 9h. 48m. ♄ Tauri (mag. 4.7) occulted by the moon.
- 1-6. Epoch of the Aquarid meteoric shower (radiant 338°-2°).
- 2. 5h. Venus in conjunction with moon. Venus 4° 55' N.
- 5. 11h. 48m. to 12h. 42m. A¹ Cancri (mag. 5.6) occulted by the moon.
- 6. 11h. 1m. to 11h. 51m. ω Leonis (mag. 5.6) occulted by the moon.
- 7. 10h. 43m. to 11h. 49m. 19 Sextantis (mag. 6.0) occulted by the moon.
- 15. Venus. Illuminated portion of disc, 0.402; Mars, 0.975.
- 22. 10h. 8.7m. Jupiter's Sat. IV. in conjunction N. of the planet.
- 27. 7h. Jupiter in opposition to the sun.
- 28. Total eclipse of the sun, partially visible at Greenwich.

NO. 1591, VOL. 61]

Times of Occurrence and Magnitude for places in the British Isles.

Place.	Eclipse begins. h. m.	Middle of eclipse. h. m.	Eclipse Ends. h. m.	Magnitude.
Greenwich ...	2 47 0	3 54 9	4 57 5	0.681
Cambridge ...	2 46 7	3 53 9	4 56 0	0.664
Oxford ...	2 45 3	3 53 6	4 56 7	0.683
Liverpool ...	2 42 1	3 49 9	4 52 9	0.655
Edinburgh ...	2 40 8	3 46 1	4 47 4	0.550
Dublin ...	2 37 9	3 47 4	4 52 0	0.676

This is the largest solar eclipse visible in England since that of 1870 December 22, when about eight-tenths of the sun were obscured.

31. 18h. Venus at her greatest brilliancy.

PHOTOGRAPHS OF THE AURORA SPECTRUM.—M. Paulsen describes in *Comptes rendus*, cxxx. pp. 655-656, 1900, his successful attempts to obtain a photographic record of the spectrum of the aurora borealis. His station was in Iceland, where he states the displays were very vivid during the period December 31, 1899, to January 25, 1900, and photographs were obtained with two spectrographs, one having a quartz train for recording especially the ultra-violet, the second with glass components. In all twenty-two lines have been recorded, of which sixteen are new. Their wave-lengths have been provisionally determined by means of comparison photographs of the spectra of air and metals, and are as follows:—

- Strong lines: 337, 358, 391, 420.
- Faint lines: 353, 371, 376, 381, 393, 397, 402, 406, 412, 417, 422, 432, 436, 443, 449, 456, 463, 470.

The four strong lines were obtained from even feeble streamers, but for the others it was necessary to keep the spectroscope in the brightest regions. Besides the lines given, several others can be seen between λλ 357 and 250, but are too feeble for reduction.

NEW VARIABLE STAR IN TAURUS.—Dr. Anderson, of Edinburgh, announces in the *Astronomische Nachrichten* (Bd. 152, No. 3634), that he has detected variability in the star having the following position for 1855:—

R. A. = 5h. 44.1m.
Decl. = + 15° 45'.

This star is not in the B.D., and some years ago he found it about magnitude 9.25, while on 1899 November 8 it was invisible in a 3-inch refractor, which plainly showed a neighbouring star of 11 mag. On 1900 March 26 it was about 9.7 mag.

NEW VARIABLE IN CASSIOPEIA.—In the *Astronomische Nachrichten* (No. 3634), Dr. Anderson also announces the variability of a star in Cassiopeia, whose position for 1855 is

R. A. = 23h. 48.4m.
Decl. = + 52° 55'.

On 1900 February 10 the star was 9.6 mag.; but on March 17 and 25 it was less than 10.5 mag.

FORMULA FOR ATMOSPHERIC REFRACTION.—In the *Comptes rendus* (vol. cxxx. pp. 1060-1061, 1900), M. L. Cruls gives a simple formula for calculating the astronomical atmospheric refraction, which is found to give results very closely in agreement with those calculated from Laplace's formula.

The equation is

$$R = (60'' \tan z - 1'' \tan^2 z) \left(0.00138B - 0.00001 \frac{B}{t} \right),$$

in which R is the refraction, z the zenith distance of the object, B the barometric pressure, and t the temperature in degrees Centigrade at the time of observation.

A table of comparisons is given, showing that the difference in the refraction, as obtained from the above formula and that of Laplace, is only 0.2 at 10° zenith distance, the error gradually increasing as the horizon is approached; but even at 70° zenith distance the two formulæ give results differing only by 1.6 of arc.

DETERMINATION OF AXIS AND COMPRESSION OF NEPTUNE.—The *Astronomical Journal*, No. 479 (vol. xx. pp. 181-185), contains an article by Prof. S. J. Brown, of the U.S. Naval Observatory, on the determination of the position of Neptune's axis, and the degree of its polar compression from an investigation of the perturbations of the orbit of its satellite. Eighteen